Notebook Series -- Notebooks by Edison
Notebook, N-12-07-28

This notebook was probably used by Edison during the period July-August 1912; the entries dated June appear to have been made in July. The notes and drawings pertain primarily to electroplating processes involved in disc record manufacture. The book begins with notations made throughout the night of July 28th and into the morning of July 29th. This first set of notes ends with the comment "up all night." Included in these and subsequent entries are notes on experiments to determine the best plating solution and conditions for the production of the "master moulds" from which submaster records and working molds were later produced for pressing records. Also included are notes on several attempts to toughen the waxy composition of the initially recorded "white master" discs, so that the first intermediate or "submaster" transfer could be made by pressing rather than electroplating. There is also a comment on Edison's work habits. Edison's notes indicate that David A. Dodd, H. Grimes, Sherwood T. (Sam) Moore, and Frederick P. Ott assisted him in some instances. The front cover is labeled "B." The pages are unnumbered. Approximately 75 pages have been used.

July 28 1912

Experiments to determine best way to plate thin nickel over the copper master mould — our present method which is to put 1 @ 3 amp on for some time so the coats seems to add some roughness in record surface —— also to plate nickel direct on gold master instead of copper & do away with the copper altogether — or plate in 5/1000 thick or so & finish with copper ——

1st Experiment 1.6 inch surface of copper brightened with fine

Emery — 2 min in bath having some free acid — 1/2 amp equals 35 amp on 10"

Very much gassing - Condition of Solution unknown. Covered good except where scratches which cannot be more than 1/4 inch and yet these are not plated in balloon. Every depression shows no plating -

This is bad on a master where there are deep recess indentations

The tops of hills plate first valleys much later.

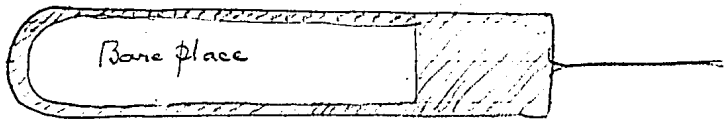
Even pulling it in solution for 3/4 min longer & stirring does no good -

The solution has free H_2SO_4 -

I then took solution plain sulphate slightly acid & in 2 min while stirring scarcely got [with 1/2 amp on 1 1/2 inch sq plate] any deposit. I then made it a little alkaline with ammonia, strong blueing of litmus, it covered in 15 seconds

and nearly covered all the bottom of the deep scratches —

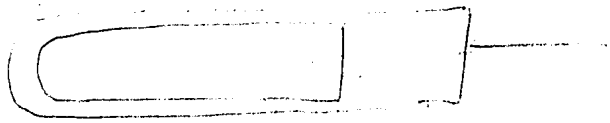
Evidently a highly ammoniacal solution is good for coating a master blank with a thin coat, solution smells of ammonia — The coat adheres tenaciously as I couldn't get it off with the finest grade of Emery paper —



I take a strip & use Condensite Varnish & varnish all over except at bare place & see how thick it will go before peeling — density 1/2 amp on one inch, or 108 amp on 10" disc of course it goes bad but appears to go plating OK — at end 7 minutes it started cracking &

peeling to about ⅛ of a thousandth or more, This seems to show that ammoniacal solution will make it peel=

put in Reg MSO_4 solution slightly acid from working – 10 min at 300 MA – plain Copper Cathode, just covered + that's all, few deep scratches not fully covered. 5 minutes more + it would have been covered –



Other side not varnished by mistake – 10 oz in – 300 MA – 10 12 or 10 minutes Coated – but several deep places not covered its very thin + the Efficiency must be awfully low, Evidently free acid eats it off as fast or nearly as fast as deposited, I will now just make it alkaline –

Now alkaline – perhaps it will not crack off now with the 1st coat from acid solution – 380 MA 10 18 pm –

After 10 min it peels off worse than deposited direct on the copper by scraping finger nail over the flake separate & shows the nickel deposited from nickel sulphate OK & tuck-

This is a fine way to make thin nickel bronze powder - use a polished nickel base put on copper by acid sulphate of the then deposit from Chlorides 2½ 504 sol at 3/4 amps sqr inch & after 10 minutes more or less scrape off mechanically comes off easy & leaves none behind - Not a trace under micro powdery by proper manipulation could make flake for electroplating the way =

I now make it very ammoniacal 1035 PM - it went to 600 MU - Didnt strip but full of isolated warts, [illegible]

Evidently too much alkali makes knobs

700 ma put in a lot of FeSO4 but there is a precipitate & bath is probably discharged
1049 - Still strongly alkaline - put in a new grid - not varnished on back - Ng - flakes are 3 times larger & all come off

New saturated sol NiSO4 neutral
1104 pm - 105 ma - varnished all over except the bare spot equals 1" about, apparently no gas comes off - 1122 = peels off not cracked in separate pieces to any extent like previous expts but starts to peel at edges
This is NG 15 mins on

120 ma — 1137 — Saturated $MiSO_4$ with some ferrous sulphate slightly acid, 2% about 8 grams — solution neutral, No gas appears to come off — 1152 off — 15 min it cracked & peeled at edges — also it didn't plate at center shows copper — Scraping over the hot plate of the varnish evidently oxidized in spots, & see little cracks & tarnishing especially along warm edges hence of copper Matter is dried too long or with heat it walls not lay homogeneously covered by undulating —

Recovere

1158 pm — dipped a new dried cover heater cathode & hollowed into Dilute H_2SO_4 warm for 1/4 min then washed & put in the above solution which is MSO_4 saturated with little H_2SO_4 sat in it sol being neutral

off 1213 15 min – self peeled, spots not coated at all –

New Cathode, same solution but 550 Ma – on 1216 – little gas comes off – – didn't cover in spots peeled badly – some places covered & didn't peel – shows high density not bad

1128 = put twice as much $NiNH_4SO_4$ in as I originally put $FeSO_4$ in – polished just a little the bare part of the Copper with finest Emery – 120 Ma –

No peel even at Edges but there seems to have been gas bubbles & these prevented plating thick at these spots, they are plated however – this looks promising I put it back & only had it out 1/2 min washed it so could see with Microg it was covered with bubbles when taken out & had to wash them off = If we are to

use this process must rotate rather strongly = no gas seems to come off cathode in solution, still 120 ma — 1250 look at out for moment no peeling — surface covered with bubbles =
out at 1158 — 30 minutes in all together started at point of the edge to peel, it pulls off in sheets.
Dont curl much —

On 108 AM — put another small dish of NH4 Fe Sulphate in this makes 3/4 of dish Fe SO4 sat + 2 dishes of Fe NH4 SO4 =
seems unlike the other solution to make lot of big adherent bubbles the adhere to cathode + dont come to top, cant see any gas arising = very strong stirring of cathode in solution dont shake them all off — BEWARE GAS with this process

Solution is now getting slightly acid probably because anode dont work good, Remember the Solution is plain $NiSO_4$ but the Iron added is Ferrous ammon Sulphate still 120 ma — 30 min No peel Even around Edges, can see Cavities where bubbles seem, I put it in again — (Shake acid)

One hour on — it dont peel bending cathode on clock

Only Cracks it it will not strip = I noticed early say 10 minutes that there was cracks thought they were scratches ~~that~~ plated over but I know now they are Cracks, while there is no tendency to Curl + peel there is a tension + it holds so strong To. the Copper that before it lucc let go it will contract + crack

under the 1/4" objective you can see no opening in the crack but it appears to be cracks -

I now add another cup of Ferrous Ammon Sulphate, on 221 am - slightly more acid than before, anode not working good - 140 ma — putting in a new cathode —

look it out to look at it at 233, OK covered no cracks but there were crystals on it added water & washed them off in hydrant think too saturated, still 140 ma — after 25 minutes looked under micro - no peel but its started to crack all over —

3 am - put another cup full - 30 cc $FeNH_4SO_4$ — this makes 90 cc after + 20 cc $FeSO_4$ — about 1/2 + 1/2 now

Note why not taken hold the transfer longer say 3 times longer under pressure + 325-till it gets more hardened — Then it will not be likely to crack to grains upon cool —

On at 3 am — but as the double salt has less Fe probably 60% Fe SO4 in equivalent, 130 ma —
at 310 am —
30 min in scarcely any cracks but solution too saturated Crystals formed on cathode and prevented plating where Crystal was attached —

Note shape of the Crystals can be preserved as the nickel plates around them + up sides washing in water dissolves crystals + leaves perfect matrix —

Diluted above solution considerably — about 1/2 much poured out + water put in put in two cathodes at
335 am — just little acid nearly neutral —
140 ma — probably the extra gassing or adherence of bubbles

Note the Nickel Coated Cathode that Cracked (10) the Ni I put in 4 plated 2 or 3/1000 no peel turned up Edges — the plated Copper took nearly all of the Nickel with it showing that if was plate 1/4/1000 & then transfer to Copper it will be OK Some of the Cracks Even showed Copper plated Iron —

The trick will be to plate 1/4 or 1/8 of 1/1000 without Cracking or drawing up —

We undoubtedly can do with the Ni Sol off before going in Cu bath, but even if we Cant Nickel in Copper which is good dont hurt much,

442 The 5 Cells on

to the Cathode is due to the high Viscosity of the Saturated Solution — in former Expts —

No peel 30 min only few cracks around Edge, didnt take it out, as I think it instantly oxdizes — 2nd Coat Cracks — This is four result seems to be 1/2 of thousandth thick,

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New Solution 7/10 Thio Saturated

$NiSO_4$ — nearly Saturated Sol Mangan Ammon Sulphate made just slightly alkaline — Use here - a Nickel Cathode Shellac'd On 4 14 am —

150 Ma - Neutral —

Sediment in Carboy — recession of Solubility on account some Ions I guess didnt get Enough dealer in —

off 450 36 minutes —

NG - all flaked off - flakes bad

Note

The Ni Cathode in the Ni Amm Chloride $NiSO_4$ sol got very black & it cannot be wiped off — Could blacken iron Ni Eta this way for ornaments.

to be run at 100 Ma —

No 11 saturated $Ni(NH_4SO_4)$ 100 pts 8 pts $Fe(NH_4SO_4)$ — filtered not quite ~~[illegible]~~ filtered so don't crystalize out Nickel Cathodes

No 12	Same	but	16 pts	$Fe(NH_4SO_4)$
13	"	"	32	"
14	"		50	"
15			75	"

On at 442 AM —

I notice that solutions are getting cloudy from over saturation, 515 took No 11 out not cracked or peeled its fine there is precipitate floating in liquid

The piece from No 11 Calibrate Calliper
all over 3/4 of 1000 of inch
its smooth even on outside =

Didnt take them out = area of bare
place 2.6 inches density 100
Ma — 38 milliamp per inch —
10" disc has 88 sqr inches makes the
density 3.3 amperes per disc
No 11 at 5 42 or 1 hour just
started peel at lower edge No
Cracks look hard + it came off
beautifully uniform + tough — flat +
perfect = No 12 came off of itself
in solution intact while No
13 14 or 15 all cracked up
+ worse the number went up —
15 is brown — No 11 is perfect, I
now go the other way —

$MnSO_4$ neutral put in about
1/4 back of $NaHKg$ SO_4 —
then chilled so no crystal
will form, will put on
50 Wed amperes, + run

One hour —

Nearly neutral on 520 —
6 20 AM — Cracked Longitudinally
MG = bright,

2.75" 5 gr

These Cathodes were Ni + Vanadium

So far 100 parts
$NiNH_4SO_4$ + 8 parts
$FeNH_4SO_4$ with dilution
of 1/4 to 1/3rd with water to
prevent hydrolysis, with a
density of 100 ma to
2.75 square inches is
the best giving in 1 hour
3/4/1000, tapped the
Cathode to dislodge
bubbles — but rapid rotation
will be necessary as effect
of [illegible] in [illegible] —
Also def must be free from
precipitate,
Check 1½ to 1½ amp 1 hour for
10" disc be ok then to Copper —

Even 12 hours work showing very range of [illegible]

No 16 — saturated sol of $NiNH_4SO_4$
100 parts of [illegible] to 6 parts
of $FeNH_4SO_4$ — on test

No 17 — same but with 4 parts
of $FeNH_4SO_4$ on test

No 18 same ~~but~~ with 3 parts
$FeNH_4SO_4$

No 19 = same ~~but~~ 2 parts
$FeNH_4SO_4$

No 20 Same but 1 part
$FeNH_4SO_4$ — on test

Each solution after making
add 1/3 of its bulk of
Water, let stand few minutes
& filter

On at 615 am 100 Ma –

Nos 12 13 & 20. Had their NH_4SO_4 diluted by adding to 200 cc of saturated sol 100 cc water then, 200 cc was poured into each cell, the balance thrown away so sol is not nearly saturated, after each 200 cc was put in cell the concentrated sol of $Fe_2(NH_4)_2SO_3$ was added – it increased back but little, it was well mixed –

Notwithstanding this dilution the solution at 640 are cloudy probably precipitate perhaps the anode not taking the free acids decompose the electrolyte

Beware of Cloudy Solution find out how to stop it –

650 – Nos 16 + 17 started peel at one edge No 16 the most 17. only a little, 9 peeled both, 17 was perfect 16 nearly so 20 was still OK –

put 16 + 17 back so 20 could go further, 17 is very fine sheet both sides —

Beware, dirt, or sponge makes depressions - or thin places —

No 20 peeled at edge at 7.05 cm — Came off perfect sheet, little more spongy than 16 + 17 - fine surface on both sides —

Will filter the Solution once if it clouds again — when Current on —

No 16 & filtered & then put in ½ small porcelain funnel & desh of Glucose — dissolved it

17 & only filtered —

20 Left it alone as it was very little cloudy

Note

No 16 17 or 20 will permit of large sheets of Nickel being made & stripped off from a polished Nickel Cathode & about 1/2/1000 thick probably less —
After annealing in Hydrogen they will be tough & soft
they are in No 20 near that now —

Started at 100 Ma at 747 am

1 Hour — 16 — peeled bad —
had glucose = 1/3rd so not peeled

No 17 — just flakes only
peeled. rather bad —

No 20 left alone so still
fine & good,

I left it in longer —

Dont understand this —

~~No~~ all slightly cloud — No 20 least
No 20 has not clouded any more

No 17 did not cloud —

No 16 clouded a little,

I wonder if plain Double
Salt wont do just as
well —

The strip 1 hours No 20 at 100 ma
peel in Copper - stripped off
with Copper which it adhere
Tenaciously — There has been
Cracks in it as I can see in Micro
its about 1/2 thousandth thick

Think 1/4/1000 in no 20 Solution
Can be worked on the gold disc
& quickly transferred to Copper
& plated at density of 75 @ 100
ma per 2 3/4 inches surface —

But to plate all nickel
further Expts necessary

to get 1/2 To 1/1000 on gold further
Expts necessary —

Up all night —

29th June 1912

1/3rd diluted Sat Sol $NH_4NH_4SO_4$ —
200 cc & 4 cc of Saturated
Sol — Cadmium NH_4SO_4 —
on 3.28. Pm — 100 ma

Dep with 15 cc saturated $CdNH_4SO_4$
on 3.30. pm —

Dep 30 cc $CdNH_4SO_4$ on 332

None any good —

June 30 1912

Test for plating Ni, direct on already nickel mould which would correspond to gold in case of cracking or peeling —

Time 4.59 pm —

21000 cc $NiNH_4SO_4$ +
250 cc $FeNH_4SO_4$ —

Ni anode — a Regular second mould already nickeled — old mould — palladium Vienna lime

Crack metalized 2 Cells —
Growing 2 ochsgrees —
it stopped but heard turned crack till bad contact was fixed only ½ minute longer.

Crack makes 42 Rev min —

Temperature ~~Solution~~ C when plating 81 = 7 Fahr —
I notice solution is clouding slightly from the Fe precipitating, it would have to be filtered each time
Started 2 amp full —

OVER

June 30 1912

After 20 minutes and quite cloudy from the precipitate scarcely see the disc colorless when first put in ~~[illegible]~~ it was clear

Current after 20 minutes flickers between 1.8 + 1.6 · all resistance out except small section of Carbon Rod + that up hard

It needs 3 cells to give 3 amp + something to reduce it ok.

Perhaps if wound [illegible] better.

Solution I found is slightly acid = it was neutral when started =

June 30 1912

Made Ni NH_4SO_4 sol — put in 1/3rd or 1/4 of $CuSO_4$ — plated out Copper — it was acid — I then added NH_4 till precip heavy then little more till quite blue think most precip dissolved — then is highly alkaline — Nickel now plates out bright — Cant say if any Copper is coming out with it — Can tell in 1/2 hour because then it will crack if no Cu goes in with it —

230 ma on at 917 pm at 925 Examined it, Ni ok but dark lines, little fine specs copper plating out separately — added more NH_4 very much more Now 280 ma —

Copper keeps coming out for months Even in dilute Excess Ni NH_4SO_4 —

June 30 1912

I now take 1% $NaHSO_4$ + add large overdose $NaOH$ so it smells strongly
No precip — plates fine on Copper — I now put in a Nickel Electrode with Condensite Cover — 9.52 pui — 200 ma —

Looks fine at 10 pui —
at 10.06 230 ma —
Does seem to deposit much ni —
the Varnish came off by excess alkali dissolving — then varnishing Cathode with Paraphine in Benzol

While waiting I put in —
3 or 4 grams of Cadmium Sulphate $CdSO_4$ dissolves in $NaOH$ + as the solution is very alkali it makes a clear solution —
450 ma — forming don't change deposition much showing very little gas — on at
10.28 530 500 ma
Only Cd appears plate out, filmed on Polyp — Emptied about 1/2 + put in fresh 1% SO_4 to dilute the Cd — very commercial —

June 30 1912

No use Cd dont work —

Now use $Na_2NH_4SO_4$ with sulphate Zinc about 2 grams or less + put it in sol & dissolve then add NH_4 till highly alkaline — $ZnO(H_2)$ is sol in NH_4 —
Its plating out — 200 MA —
~~now 140~~ seems to be fair its darkish — but micro shows fine grain —

Put in New Nickel coated with Parryfile from Bengal — in above Zn Sol On at 11 Am 140 MA —
1117 200 MA - shaking dont change it
Get little probably but little grain
1130 - Thought it had not plated looks dull no Cracks = but Ruffs at Edges chipped off poor adhesion very thick deposit as its brittle it may be all zinc —
if not its fine = sticks strong to Ni Cathode — no signs of peel —

June 30 1912

German Ni Plating So 200 cc
100 cc H_2O, on 12 midnight –
110 ma – 2 Edison 513 Calls –
now 12 12 am 600 ma –

German salt = peeled (ie) cracked
but very thick & put in fresh
Cathode & Ran 4 hrs & it cut
200 ma – on 12 27
just electrical peel at bottom edge,
adhered stronger than the first with
5 cc Ferrous – but there was a quite
due to gas bubbles which were
not on mine 30 min is same
as mine at 1 hour on had 200 ma
instead 100 – The German Nickel
is not so springy
Callipers average 8/10 ths of
1000 whereas 5 cc Ferrous was
only 4/10 ths –

Blushed Ni Cathode with Copper
6 amp per 10" above 5 seconds it completely
Covered then put in German Nic Salt
at 300 ma 1 30 am – of 2 35
was 330 ma – only peeled one edge
Copper came off with it See 2 pages ahead

June 30 1912

200 cc Sat Sol $NiNH_4SO_3$ diluted with 100 cc H_2O Made neutral to Litmus – 5 cc of saturated Ferrous Sulphate added –

Run 1 hour + 5 min at 100 ma – Sheet then clarified strip off Came off perfect = The solution was cloudy from precip from minutes after starting – Sheet Calliperis – It was as bright on outside as the side against the Cathode – Calliperd 4/10 the of thousandths –

The 10 cc Ferrous peaked in 30 mins
15 cc 20
25 cc peaked + fell off in some time less than 20 minutes – while acid solution gave no deposit + Ferric Sulphate 10 cc gave a worthy deposit not very thick that I cannot get off – THIS IS PROMISING –

June 30 1912

New scheme Gold plate white
Nearly black with Copper till just
Covered then put on Nickel plating
bath and plate Nickel ½ thousandth
thick on the Copper – then put
on Copper bath a plate to full
thickness

pour on Copper Solution we use
for dissolving Copper from
Nickel flake & then gives a
Nickel surface 10 times thicker
than we have put it on surface
of Mould as we do now
No matter how thick the Nickel
is it does not alter the surface
The Mould can then be polished
with Vienna Lime –

June 30 1912

German Silt – Stripped it off its
quite thick Its 2/1000 thick
showing that Copper is going to hold
it from Cracking

Used fresh solution German –
I notice its little acid & the one I
took off & threw away was exactly
same acidity –
I Coated the Nickel Cathode
Entirely over with Copper
dried it between blotting paper
& then packed it with
the Parafin – 300 ma
on at 305 am – 345 OK Cut
found some Crystals of Salt on
peeled them off by finger nail
& poured acetone solution &
detached it with water –
300 ma is about 8 amperes per dive –
4.05 only a small turn up at bottom
edge 1/16 thin – Calliper
1.3/10th thousand

Sample Marked
X

This moves scheme on other
page working

The so beat after 2 hours & 15 min - only the edge was 1/8" was turned up - it stuck to the nickel very strong all over must have take a 1/2 to 1 lb pull to strip it - when it was off it curled up two whole turns showing it is springy

I guess this will even beat the German as altho I have not tried German at 100 Ma -

The above Calliperes 12/10 thousands -
marked XXX
has better surface on outside than in -

Used 200 cc Mi Ni Hy Soy diluted with 100 cc - run it on a parallel Cathode at 100 Ma for 2 hours on 1/4 inch edge turned up - after 2 hours - see opposite page

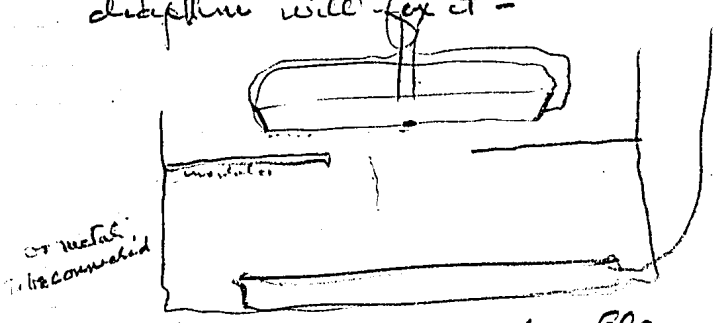
The same as above solution with 1 cc Ferric Sulphate run 2 hours didn't curl up at bottom edge like all the others but curled along sides also split a little - it was ok 1 1/2 hours at Calliperes 1.4 thousands thick it comes off quite hard from nickel but came off intact - Its just as shiny on outside as inside, in fact a little more so
Sample marked XX - it has little warts -

This is strange that so small amount of ferric Iron should do this - The solution clear but large white sediment fluffy at bottom 1/4" thick

Aug 1 1912

Experiments plating Copper thin blush 2.75 volts 300 Ma does it in 30 seconds — 45 seconds is safe — 1 min sure —
2 Cells Storage Bat —

In plating on gold it proceeds from Edge & goes slowly — hence order with get the taken deposit which is Good for new process of blushing with Cop then Nickel 1/2 1000 then Copper to right thickness & then dissolving off blush Copper by flake solution Thenk a dolphin will fix it —



This will require considerable expanse to get it even

4 minutes at 35 Ma - very light deposit Can see Nickel through it. This is 140 for 1 min or 280 for 1/2 minute which is not so good or anywhere near it as 300 Ma for 1/2 minute —

With Ni strip 2.75 inches sqr surface & density of 310 Ma — which is what it is and with fine scratches & as with sides & all disc has about 100 Square inches This would be 10 amps for 10" disc a proper plating density for 16 Baume German Solution,

Tried Electroplating Silvered, but it was dry and apparently got oxidized —

Put it in Copper.

3 amp ½ min — only a flash at one place
5 amps 15 sec
10 " 15 sec Copper only around part of edge
1 min —

5 amp 1 min just beginning flash a little in middle, Silver sections evidently not connected or thin places high resis —

5 amp 1 min Blushed little more not ½ Coated

5 amp 2 min — some part not connected — sharp edge the Silver broken for several inches Current has to travel along resistance for some inches

5 amp 2 min
5 amp 4
5 " 2
5 " 2
10 " 1 min

Total
1 amp for 1 ¼ hours

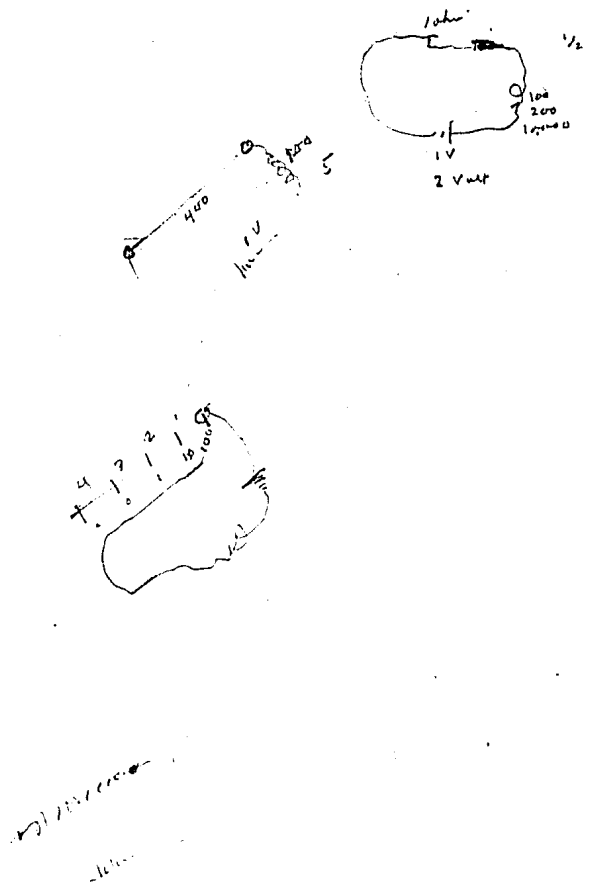
240
4
1.20

This barely covered it, there were places where you could see the ~~[illegible]~~ silver over several inches area but coppery aspect, a few spots 1/16 dia where could see silver bright,
a band around 1½ wide ~~all~~ nearly all round just thick coat copper

We then put it in German nickel stat.

Started 12 52 10 amps Ended 1 12 am — 10 amperes. Constant ~~[illegible]~~ no peeling - one or two places along scratches where copper did not plate to silver it appeared as if nickel turned up slightly. one place 1/4" at edge turned up considerably

We then put it in Copper 10 amp rate
Cat for 2 min not coated good — then 5 min — 10 amp Coated OK but could still see thinness at spots



Took it over to Grimes & he puts it in his Copper bath to make a working mould after I have developed off the Copper —

Dissolving Copper by KCy & H_2O_2 off nickel paraffined 2.75 inches 1/2 amp 2 minutes

Solution 75cc of a 5% KCy Solution + 25cc of a one percent H_2O_2 solution —

It looks as if electrode should be rotated as it eats Cu very much faster

Coppered it again 1/2 amp 2 min put in Cy at 2.52 -

Coppered again & put in will not dissolve 3rd on 5 Sq inches limit for 100 CC —

2nd Solution 50 cc of 5% Kcy
50 cc 1% H_2O_2

Eaten 2 Coppers 2.75 sq inch
Each - 1/2 amp 7 mean Cent,

3rd one now in - just done also
This is the least, as last one took longer 3/4 hour
2.75
3
7.25

8 sqrs inches for 100 cc
by using 5 Cu plating at 1/2 amp I found the most
exhausted, I now put in a 1/2 mm plating at 1/2 amp
finally a 2 mm 1/2 amp - been in 1 1/2 hours, nearly
gone,

I notice the solution used in SB for
dissolving flake Cu leaves a white
highly fluorescence basic salt on the
Nickel + colour Cu is all dissolved its
smutty dirty coated, the only way
to brighten is to put it in a weak
solution HCl, then dissolves it

I put some HCl in the solution then
the Cu dissolves leaving dirty surface
then in a minute the smut is now
dissolved by the free acid —

Dilute HCl with plenty H_2O_2 also dissolves the Cu leaving Ni bright.
Later = It also the Nickel NG —

20 KCy 5% 80 H_2O_2 1%

1st 2 min Cu 1/2 amp —
Then no good solution cloud precip —

15 grams KCy to 100 cc Water

Made solution 50 cc of KCy solution + 50 cc of Diluted 3% H_2O_2

a 2 min Copper on Pewter went off in 5 minutes —

2nd one. 50 min + not gone yet

NG

Aug 2nd 1912

We took a cracked white Wooster grafted it & got it over & started plating at 10 amp, it took 2 1/2 hours to coat over & then there was 1/4 inch in center not coated of course this spoilt it for my new idea of blushing with Copper & then putting Nickel on 1/2 of 1000 & then finishing with Cu & finally dissolving off the blush of Copper with KCN & H_2O_2 = but I put it in the German plating solution of Nickel & plated it with 10 amperes for one hours = not cracked — Grimes took it over to run 3 days to make a mould it will of course be no good but it shows can plate Ni on Cop 1/2/1000 without peeling 1/2/

15% KCy

parylite painted Cathode, of nickel 2.75 sq inch

10 cc KCy 15% 50 cc water
10 cc 3% H_2O_2 50 cc water —

2 mm ½ amp Cu in 950
dissolved in 9 minutes — 1st one 9 min

2nd on 10 2½ = off one 10 16 — 13½

3rd one on 11.09 — off 11 38 — 29 min

1st one dissolved in 9 min
2nd " 13½ "
3rd " 29 "

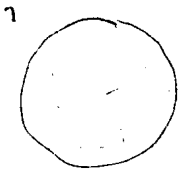
This seems to be a very good solution for this purpose — Cheap Does not attack Nickel the slightest —

It will require for 10" disc of same thickness of Copper as on 3 parylite Cathodes, 1000 cc of 15% KCy & 1000 cc of 3% H_2O_2 =

Gold plated Black. Record from a working mould

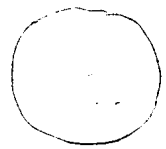
rotation Crack = SB Cup Selection
ng 9 quart —
Worked up by Moores working

3:1 amp 10 minutes.



here a little blushed
blackish spots
spots

5 minutes more blushed over 6 qt

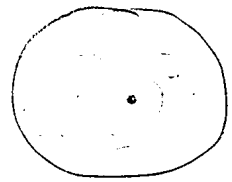


Thin Center good
Brown

5 min more, all over but thin
5" dia & spotty

5 minutes More Center good
& all over but Circle 5@6
dia not good spotty - one
large planer ... actual
size brought — Total 25 min

It shows effects of rotation



around here
streaks —

Evidently dirty here, or bad places
where water got under gold & stripped
it off — Next one we will
slow Motor down, The Speed
of rotation is now 40 Rev min —

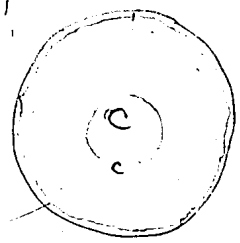
25 min at 3.1 amperes on 100 inches sq.

We Wash & Transfer to the German
Nickel Bath 40 Rev 10 amperes
for one hour started 10.51 —
9.9 amp - after 30 minutes looked
at it — not peeled but there are
hundreds of black specs as if
the original gold had been stripped
off & there will be holes

started up again at 1123
for 30 minutes more =

1 Hour 10 amp

When taken from bath
found that outer half of the
shell had peeled off but
record part intact.



C Center split
Exactly around
sharp Edge of
Label when I
pulled sheet off
1/3 is still with
sheet at C

Split 1/2 way round
at sharp Edge near Edge of record
about 3/16 in from the outer Edge

Had we taken it out after 30 minutes
it would have been O.K. - Where
it peeled nickel solution got
under & plated underneath giving
an appearance that the Copper
had been dissolved — Only 1/3 of
the underneath shows Copper

The balance having been blunted with Nickel

The sheet at either edge Callipers 2/1000 1/2 inch in our record 1.8/1000 —
showing that 30 minutes at 10 amperes is more than sufficient
These measurements of thickness is uncertain as cannot know how thick the Copper is —

Under Microscope where Copper is on side facing the record the waves + grooves look good —
By doubling off the Copper I can get the Contour of Nickel quite the second grooves —

This peeling shows, that sharp edges is bad — they should be rounded —

Also there are numerous holes through the peeled sheet, even very out near edge

where its 2/1000 thick - these
black spots were noted when
we blushed with Copper —
on inner edge near label edge
there are several dozen of these
holes, also larger places

We now take another gold coated record from Conch working mould —
& use Grimes Nickel plating sol instead of Butt's Copper sol

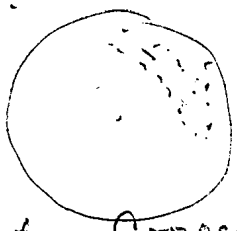
3 amp 10 minutes didnt cover perfectly — inner part just browned put on 6 amperes for 5 minutes more — Covered but inner part reddish showing very thin coat — or poor conducting gold — numerous holes & several black spots distributed over whole of the record. very black as if no gold ever got there —
These spots will bridge nickel plating gets thicker & leaves a bad facility in the mould —

The looks & action of this mould is very much better than the first black one but they both show inner part bad —

We will plate nickel from Superhum solution for 30 minutes at 10 amperes —

OK only a small split 1/4" long at the edge where they put the ring which is 1/8 inward from the edge of the wafer = This ring is a special thing never used except for testing for such wafer moulds + not necessary if has an extremely sharp edge + will not be used in production

I notice lot of peculiar constellation of spots on outer edge when we look at it out.



then

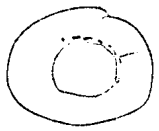
We now put it in Copper with 15 amp for 1 hours to prevent curling as we propose

stripping the sheet from the master to study it & the sheet to ascertain the cause of the defect. —

Also to develop the copper off & note appearance of the nickel record surface — get at the thickness of the copper actually on the record —

Its unfortunate that Grimes never got record from Council mould — Have got the plate 2 submasters that we know are really good — & we will carry these from to working moulds —

Mould out at 215° — Can see the record waves — The inner part



Loose around here you can feel it, Copper was not thick enough to hold the nickel

We washed it in hydrant water
Then distilled water & dry
it = its looks good - but
the 1/2" of the inner part of second
next to label looks different
just as the first coat of copper
looked red - also sharp outline -
where it changes appearance -

Evidently gold doesn't plate as
well underneath as on other Edges
or its due to long travel
from the Edges

We could have 2 long strips
& 2 short ones, ~~[illegible]~~ & disconnect
after switch the long ones after
6 hours & put the 2 shorts
ones on 2 hours to plate gold
thicker in middle =

"

We cut it around Edges
& Took it off it laid flat,

Its full of holes, one hole

had allowed considerable solution to pass through & spread over a round space & crystalized. This gave the appearance of a crumpled record as if gold had crumpled on cooling it at devon-port & the metal underneath was OK — It was crystals of the solution & these crystals were on the metal that print was taken from. These crystals were hard enough to impress the black deposit & practically solution spattered on mount.

There are holes all through the metal sheet some of them .003 to .004 dia — solution around holes were found on face — gas had formed bubbles —

Altogether the black deposits are not promising

am now going to use
white Mentan at 120 Fah
about grafted in non flow
mould in vacuum to make
submarine — an Experiment of
hand pressing shows that it
can be done under present
conditions where it failed
2 yrs ago under improper
conditions —

Aug 3 1912

Experiments to mix something
with white wax that will
toughen it so we can make
submarine for use by
pressing with a little heat
fried add the amount Sulphur
40 or 50 previously made by
Goldstein mixing a little with
white wax pouring sample
then mixing more & pouring
sample on and on

(over)

Benzoylazotide

This is a powerful softener only a little is required of pure Salt melts to transparent Exceedingly Tough stuff - not Sticky — 2 & 3rd [illegible] not used too much —

Azobenzoide -

Very ~~little~~ little will soften - + can soften up to any amount until get too much in the grits — The wax is still brittle but tough (ie) breaks readily but cuts deadly tough chips — dry at ord temperature — pure stuff melts to glass

Azobenzoidin, can soften to any extent don't want much - with a certain amount it feels dry taken fine impression of Rimmelon a bit dry shiny - yet you can bend it right through with smaller amount brittle but cut a little tougher than white wax the good — None Left

Furferin
Little well answers — brittle but cuts like
hard — dry — its almost transparent
Think it Varnishes in air — dull
from dish — pure stuff melts to glass

Oleate Mannityl —
Very little required, good. 5 inflam.
tough — grease good dried — have to
5 grms + impunds fair, brittle when little
in but cuts tough impress good —
pure stuff melts tough viscous dull,

Ceresin added to req white wax
will also toughen + take good
impress shiny —

Fred Otts No 1 2 & 3

No 3 under 600 lbs filled fairly well — at little pulled off on taking mould off wax — at spots on outer edge — some places not well filled —

No 1 did not fill at all on high places on waves went in matching block —

Experiments on way to take submarine impressions —

Aug 4th 1912 All at ordinary temperature 80 @ 85

100 Reg white medium wax
5 grms White Ceresin —
Screw press — Too dry dont fill —

95 Reg white
10 Ceresin
Dont fill — dry

90 Reg white
15 Ceresin Dont fill but better

85 Reg wax —
20 Ceresin
filled good —

80 White
25 Cerium
filled OK –

75 White
30 Cerium
filled

all above grafited surfaces

65 White
40 Cerium –
perfect feel no grafite
apparently no sticking

55 White
50 Cerium
less pressure filled
apparently no stick –

~~50~~ 40 White
65 Cerium
very much less pressure
Dont seem full apparently no stick

25 white
80 Ceresin

Very light, pressure
~~1/2~~ 1/2 filled

~~25 to~~ Same turned off & heavy pressure grew no grafite
Want to see if sticks

I think any where from

65 White
40 Ceresin

to 1/2 + 1/2 will do with or without grafite with moderate press

If temperature goes to 70 can use 1/2 + 1/2 of hot 65 White
40 Ceresin

A Retrial with no graphite show she fills with our pressure at 90 cohite + 15 Corrosion —

& well work ok without sticking at 55 cohite + 50 Corrosion —

& Temp of Room is — 82 —

Dadd will make grams
2 of 90 + 15 75 + 30 + 55 + 50

for trial in press to impress record from mould —

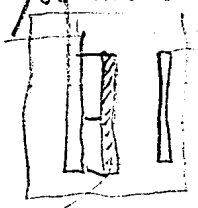
OVER

To test pressures of our screw as compared with our little hydraulic we use for pressing bullet pockets & made 2 pieces lead 1/2" sqr & pressed with screw with same pressure as we pressed white wax & found lead went from .192/000 down to .068!

To do the same thing in hydraulic required 85 atmos

So far we have been unable to print one perfect altho we have non flowing moved - in lifting off the bridge cracks clear & 2nd bracket is sticking down in bridge wall & bridge wall pulling off. Had one that was perfect except about 1 1/2 sqr inches at points mostly along outer Edge of Mould —

Germ plates nickel on Copper Mandrel
with 700 ma density for one hour

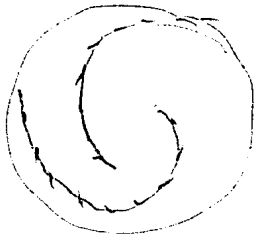


Vertical

He dont rotate.

There is fatal - only means bath,

For plating over Copper on a Galaded mandrel use 3 amp density & then covers in 10 to 15 minutes - then he raises to 10 amp & finally 15 @ 18 - to Complete -



Black submarine, Platina coin. Here
had it on 4 hours — it appeared
fairly covered in 40 minutes —

It looked nice — but you could
see by shine that platinum had
covered over a smutted section
not reflecting as well owing to
matte surface —

Put it in Copper bath (Big bath)

1/2	amp	8	min
1	"	14	"
1 1/2	"	17	"
2 1/2	"	5	"
4 1/2		15	" When copper got to Edge

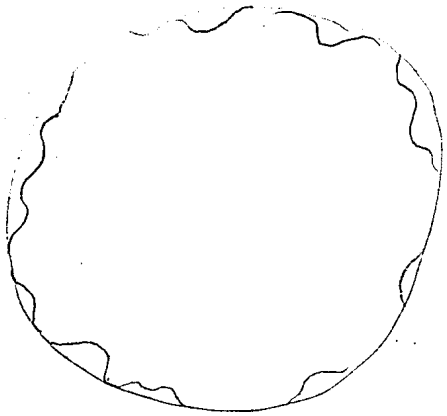
of label = in fewer mins more it covered +
coz let it go on

When Cu was in 1 1/8 inch about
we started to increase amp the current
was opened over 1 1/2 to 2 minutes & during
this time we accidently got on Iron for
a second or 2 40 amp when we
looked at it again the Copper had
advanced 5/8 about a rows of new
entirely different Color instead of
light yellow to was dark red
+ the scalloped joint between the
two deposits was very marked.

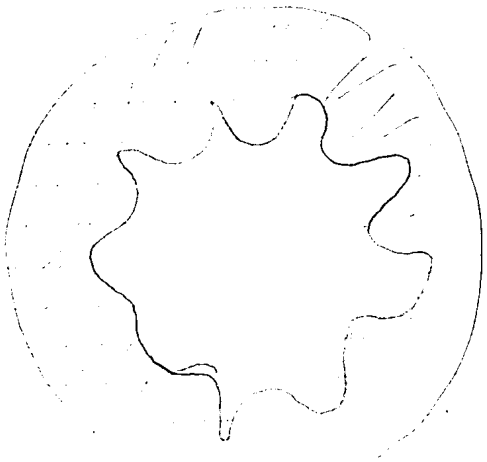
It took 1/2 amp 5 minutes before
it got up to top of Edges + then it
was in Spade or round nose
rotated double finally in 7
minutes about the dark reached
1st tracking line

This shows very poor arrangement
for Contact. The wire has kinks in it
does not lie flat + the platinum
has high resis

Think grooves put in a curved before
going in Quite Sure best,



appearance just coming over edge



appearance when 1/2 covered

This is very poor plasma has too high resistance -

We now go back to (pad) & will try Silver -

Order for Moore's Green-Rubber (Green bungalow) & 3 or 4 1 ft strips Dental Rubber thin to replace Cloth -

128 grams 1 inch –

1000/1000 –

128) 1000 (7

450) 35000 – (77

31 50

3500

128 – (1000

77 – Mil

7/1000 1 gram

1"

1" 7

128) 7 – 21/1000

35) 4500

31 0

1000

1700

3

1/4